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Split Winch - Combination Net Reel Allows Greater Variety of Fishing

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Marine Resource Advisory

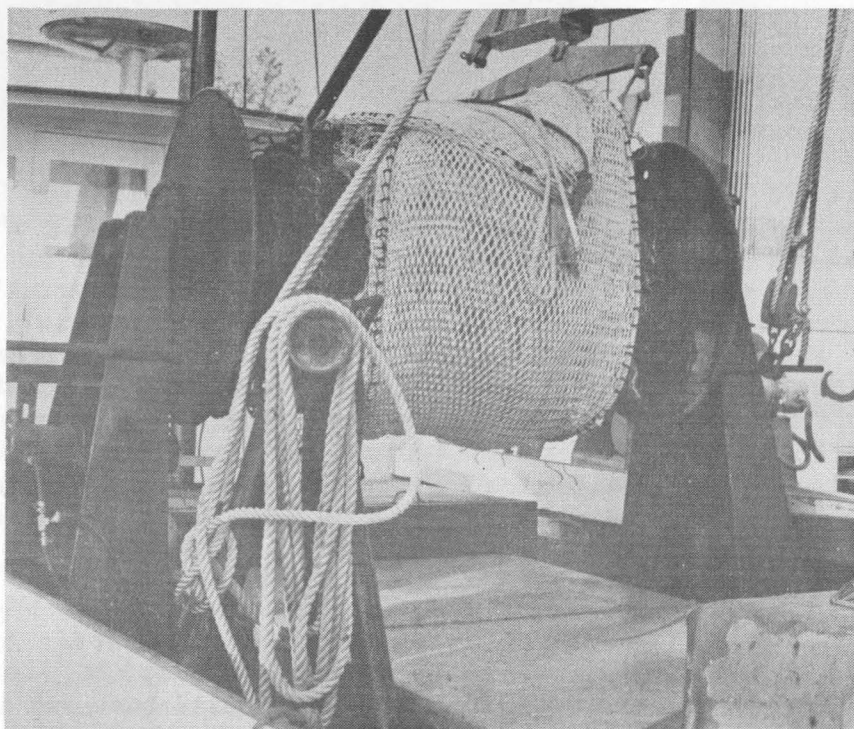
No. 26

VIRGINIA SEA GRANT MARINE ADVISORY SERVICE AT VIMS/WILLIAM & MARY

AUGUST 1984

Split Winch - Combination Net Reel Allows Greater Variety of Fishing

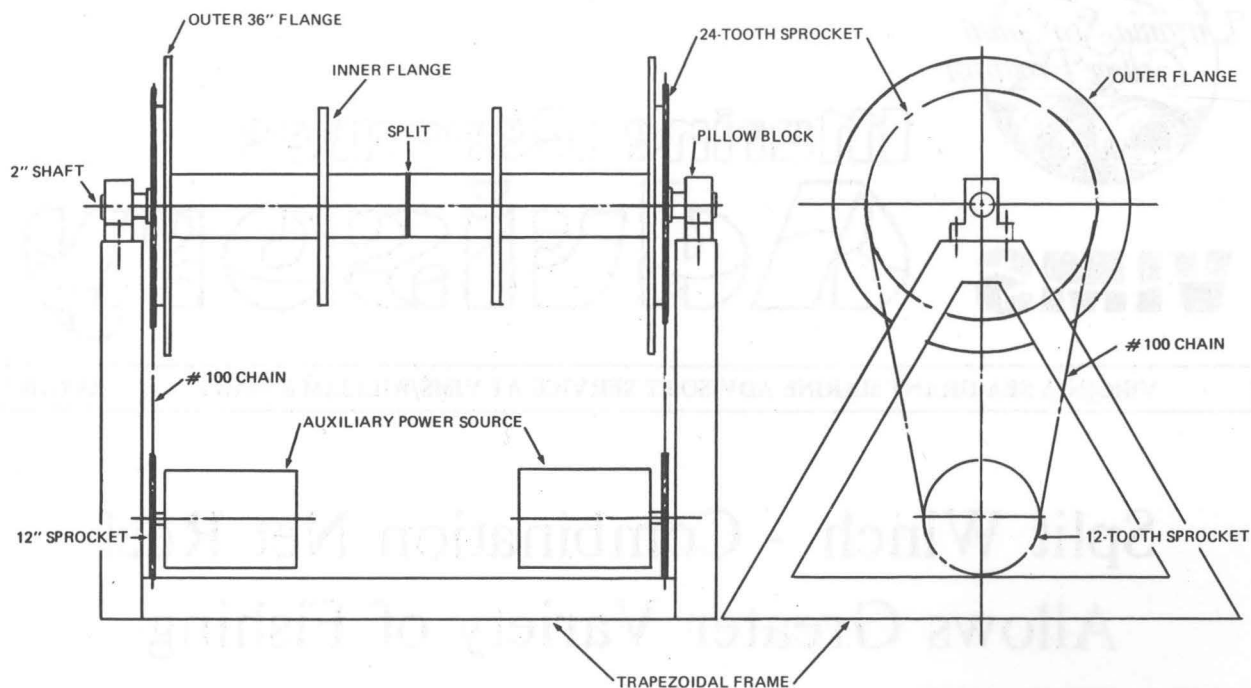
by Philip Cahill



The split winch and the tripod mounted capstan are mounted with the gilson coiled on the head. With the "Wilcox" 80/100 high rise net, ground wire and 150 fathoms of trawl wire, there is room to spare on the drums.

Traditionally, Chesapeake Bay watermen work the bay fisheries through fall and dredge for crabs in the winter. Recently tested gear developed by the Virginia Sea Grant College Program Marine Advisory Service at the Virginia Institute of Marine Science (VIMS MAS) shows great promise for allowing watermen an

additional opportunity to participate in the offshore fall and early winter flounder fishery. The gear, a single multi-purpose winch, allows the traditional Chesapeake Bay deadrise to both dredge and otter trawl, thus taking advantage of nearshore and bay fisheries year-round.



Mechanical drawing of the Split Winch-Combination Net Reel.

The "Split Winch-Combination Net Reel," the first of its type, was designed by VIMS MAS fisheries gear specialist Philip Cahill in response to requests made by fishermen seeking assistance in the development of deck machinery and gear handling components for small boat otter trawling. The versatile winch is compact and economical to construct, with total conversion ranging from \$10,000 to \$20,000 depending on size and condition of the individual boat.

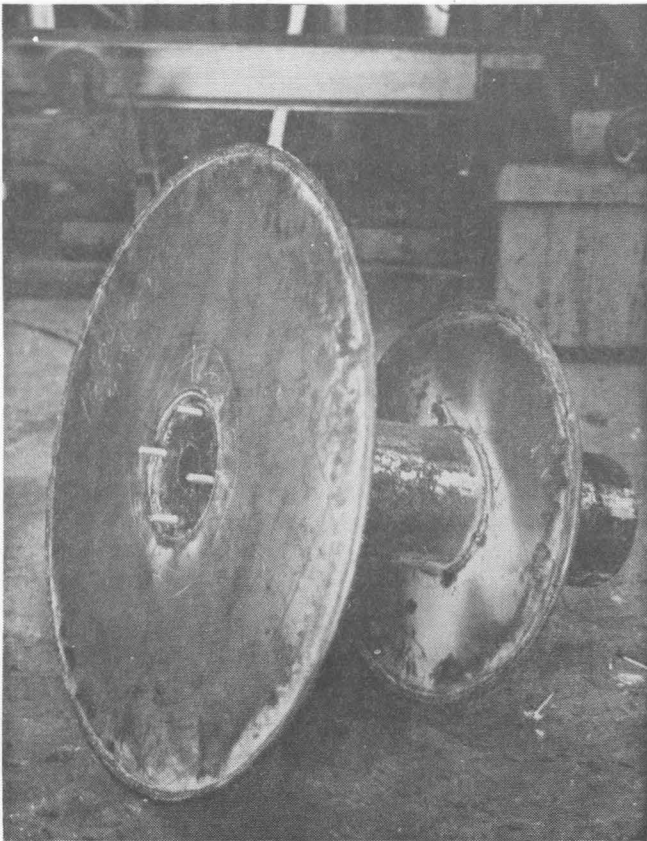
The first Split Winch-Combination Net Reel was installed in late 1983 aboard the privately owned "York Spit" from Hayes, Virginia. The 50' commercial Chesapeake Bay deadrise was completely converted from a crab-conch dredge boat to a multi-purpose otter trawler.

CASE HISTORY: THE F/V "YORK SPIT"

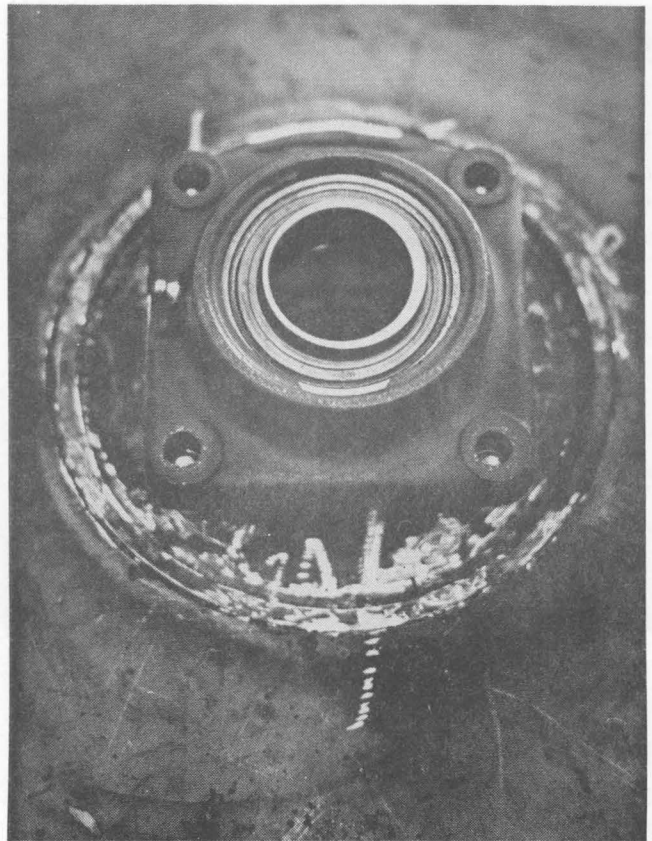
Like many Virginia watermen, the owner of the "York Spit" was interested in

expanding his harvesting capabilities to the flounder fishery by using his traditionally rigged deadrise for otter trawling. But efforts to convert the crab-conch dredge boat to otter trawling met with limited success. The boat was first modified with a 60'/40' flat net attached to the cable end of a mechanical hyster (GMC two ton truck rear-end). The mechanical hyster, although powerful and dependable, was slow hauling and dangerous when attempting to integrate the crab, conch and flounder fisheries.

One alternative was to outfit the boat with a conventional split winch system with one unit mounted port and one mounted starboard. In this type system, the cable is fairled to a hanging block supported by a gallows frame, and a stern mounted net reel is used to retrieve and haul the net. Although optimum in design and deck configuration for otter trawling, this system was not installed due to several major limitations. Cost was a prohibitive factor because each of the three separate units needed hydraulic



The outward protruding studs of the split winch accommodate the outer flange bearings.



The bearing mounts are on the outer flange of the drum.

motors for power. The system would be effective for flounder trawling but not for conch and crab dredging and the traditional layout of the deadrise would not accommodate the space constraints of the conventional split winch layout.

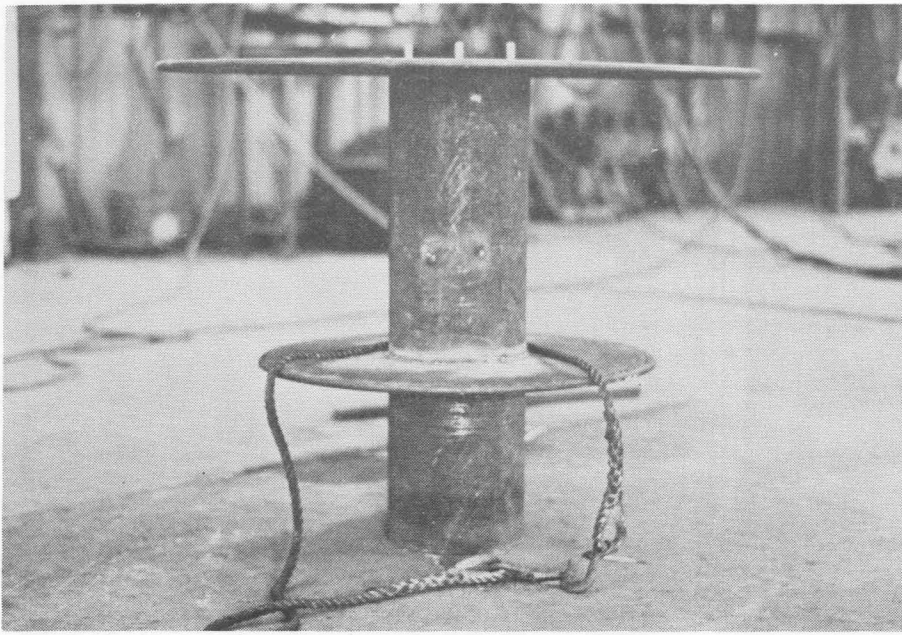
The owner of the "York Spit" opted to try the Split Winch-Combination Net Reel. The prototype was built at Calvin Hudgins Welding in Seaford, Virginia. The VIMS MAS gear specialist supplied deck and rigging designs and instructed captain, crew and owner in the techniques necessary to fabricate their own equipment. After the Split Winch-Combination Net Reel was installed and fully operational aboard the "York Spit," the boat showed excellent results during the 1983-84 flounder fishery. The new gear increased the productivity of the "York Spit" twelve-fold.

Several additional vessels are being converted to the Split Winch-Combination Net Reel, and are in the final stages of modification.

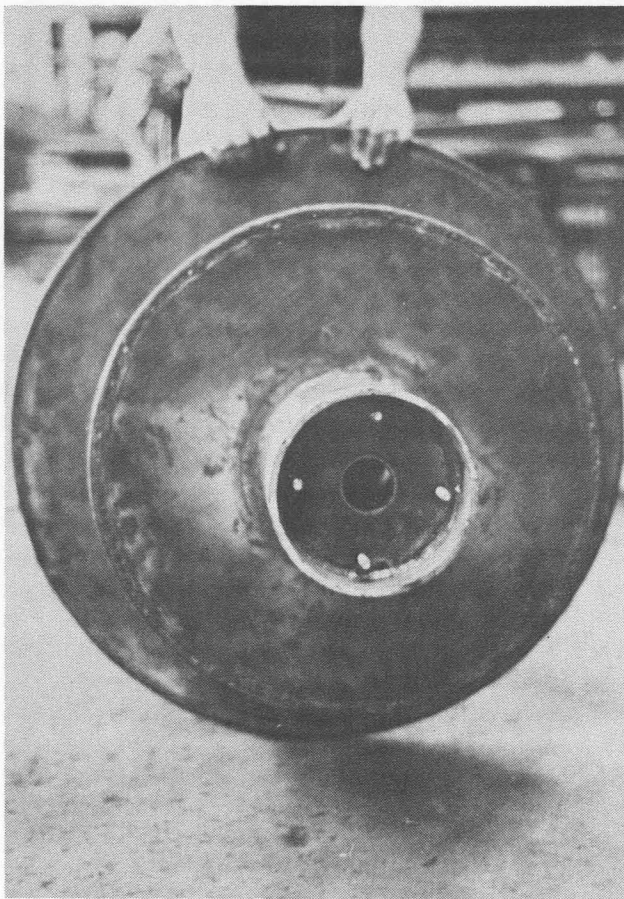
WINCH SPECIFICATIONS

The Split Winch-Combination Net Reel is three independently turning drums situated on one common axle. The outer drums are each chain driven by an externally mounted hydraulic motor with 2:1 reduction. A two-stage hydraulic pump provides a constant flow of hydraulic fluid, permitting the drums to be rotated simultaneously in forward and reverse, or turned independently in either direction.

Each motor is controlled by a separate open spool valve which varies the



Each half of the split winch has two flanges.



The inner bearing is recessed and mounted internally. This configuration allows for both drums to be split within close tolerances (1/8").

speed and direction of rotation. The valves are mounted in the pilot house, for remote control and protection from corrosive elements. A third drum, the center drum of the unit, is the net reel. The two inner 1/4" steel flanges prevent the cable from "walking" the length of the drum, and create a separate drum for net storage. Activating both hydraulic valves simultaneously causes all three winches to rotate in unison, providing a retrieval and setting mechanism for the net. The drums are mounted on a trapezoidal 1/4" steel frame that can either be bolted or welded to the deck. The frame also functions as a mount for both of the Charlin #10,000 hydraulic motors.

Braking is achieved by using open spool Greesen hydraulic valves. Safety chains are attached from the frame to a series of precut holes along the periphery of the outside flanges. In the event of a hydraulic failure this procedure eliminates any "free-wheeling" by the drums.

The hydraulic pump is mounted in the engine compartment and is chain coupled to an 8" twin disc power takeoff. Main power is a GM 671N with a 2:1 twin disc

hydraulic gear, turning a 26" X 24" three-blade propellor.

FABRICATION AND CONSTRUCTION

The drums are constructed from a single length of schedule 80 steel pipe that is cut into two equal sections. Four 2" self-aligning flange bearings are centered and bolted to a 3/8" steel disc. Each section of pipe receives two of these components. Each is concentrically inserted and spot welded to the inside surface of pipe. One is mounted flush with the outside end of the pipe and the other is recessed 4" on the opposite end of the pipe. A single 2" monel shaft is inserted through the disc-mounted flange bearings. The bearing collars are fixed to the shaft, permitting both sections of pipe to rotate freely on one common axle.

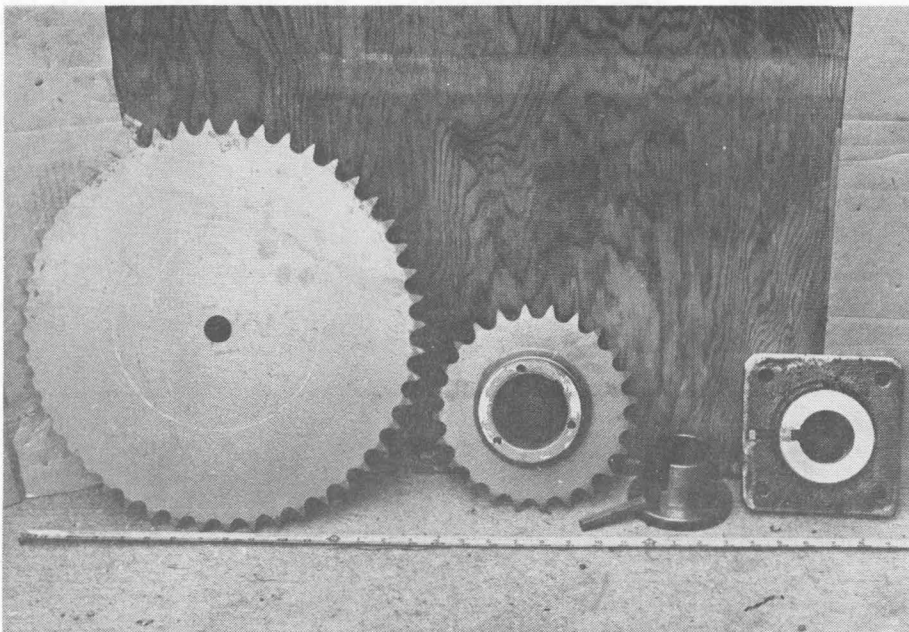
Four flanges, two 3' in diameter and two 18" in diameter are cut with a track torch from a sheet of 1/4" mild steel. An 8" diameter hole is cut in the center of each flange. The smaller diameter flanges are slid over the end of each section of pipe and the larger diameter flanges are slid 4" over the outer ends of the pipe and welded full circumference. The

smaller flanges are moved until they are both 18" from the inside surface of the outer larger flanges and welded in place.

Each flange is fitted with a 1/2" steel rod that is heated, rolled and welded to the outer edges. This border provides a "fair" rounded surface to the fast turning outer edges. This precautionary device serves to protect trawl wire from chaffing or cutting and can protect the crew from being cut or injured. A 24-tooth #100 chain sprocket is slid over the shaft, bolted to the face of each drum, and welded in place.

THE FRAME

The frame, which supports the weight of the drums, cable, ground wire and chain, must withstand the constant stress associated with trawling. A trapezoidal frame, with its wide base and tapering sides, was considered to be the best design to handle the rigors and stresses of fishing. This configuration permits easy mounting, installation and fabrication. Each frame is composed of a front plate, two sides, two internal gussets, one hydraulic motor mount and a bottom flange. This type of frame has



The difference in size between the 24-tooth and 12-tooth sprockets (left) allows for a 2:1 reduction ratio on either drum. Pictured also are the shaft sleeve and end bearing for the shaft.

also been popular for the mounting of net reels aboard modern stern trawlers.

Once the basic frame is fabricated, mounts for the hydraulic motors are constructed. The hydraulic motors chosen for this winch were Charlin #10,000 models. The mounts are composed of two pieces of 2" angle iron which are parallel and horizontally welded to the frame, approximately 2' from top center. Two pieces of 2 1/2" X 1/4" flat stock are slotted, placed vertically between the angle iron mounts and welded in place. The distance apart, or width of these slotted pieces, is determined by the type of motor installed. The hydraulic motors are fitted to a square of 1/4" steel plate with 1/2" holes drilled in each corner which mate to the slotted flat bar. This provides for an up and down adjustment for

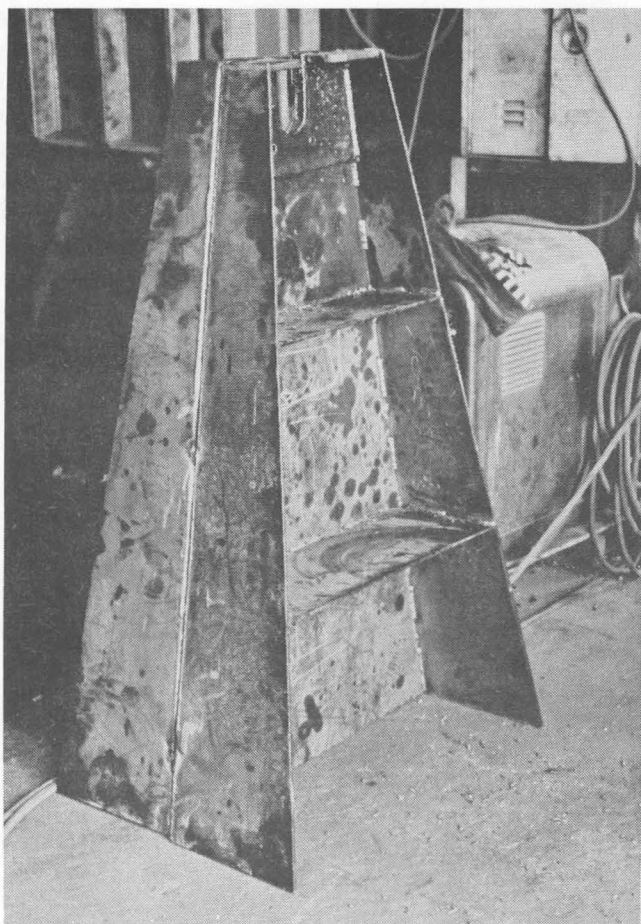
the chain between the sprockets. The hydraulic motor is then bolted to the plate. The woodruff key is inserted in the shaft and the 12-tooth sprocket is fixed in place. The winch becomes fully operational as soon as it is deck mounted and the hydraulic components are matched to the appropriate hoses and fittings.

WINCH LOCATION

The location of the winch on the vessel is an important critical consideration. Whether to mount it on the stern, amidships, or directly aft of the pilot house will depend on the vessel's design and intended use. The prototype winch was installed amidships directly over the engine box on a 50' conventional Chesapeake Bay deadrise. This placement allowed proper utilization of deck space, easy access to the engine compartment and was suitable for both trawling for finfish and dredging for crabs and conches.

This location, however, may prove to be unsatisfactory for other vessels. For example, on the traditional Maine lobster boat or "Novi" boat, it would be most effective if placed on the stern. The stern location has several advantages: (1) it eliminates all deck bollards; (2) no wire will be overhead, or underfoot; (3) no one needs to be close to the winch when hauling and setting; (4) the operator has a clear unobstructed view of the entire operation; (5) it is easier to handle the gear; (6) and it is a low cost alternative to expensive split winch systems.

It should be pointed out that in all cases the center axis of the hanging block and the winch axle should be a minimum of 2'-3' forward of the rudder shaft. Experience dictates that extreme difficulty in turning and handling will occur while towing if the tow point is aft of the rudder post.



The internal gussets add strength in the trapezoidal mounts.

SETTING, HAULING AND OPERATING

No special techniques or fittings are employed in shooting or retrieving the fishing gear. On the prototype, 250 fathoms of 5/8" galvanized trawl wire was placed on each of the outer drums, and 80' of ground wire and chain was attached to the end of the trawl wire. Five' by three' wooden bracket doors (Wharf Forge type) with conventional G-hook backstrap and trawl wire were utilized. A standard 60'/40' flat net with 20' bridles to the wings was the type of gear fished. This type of net effectively harvests fluke, blackbacks and yellow-tail flounders. It is extremely popular with fishermen from both the mid-Atlantic and New England regions.

The trawl wire and ground wire, served with the appropriate fittings, are wound on the outer drums. Because of the relatively narrow diameter of the outside drums (18"), no difficulty was encountered with the tracking of the cable, thus eliminating the necessity and expense of a level-wind mechanism. The distance of the drum from the fairlead or hanging block is a critical factor in the tracking of the cable. The longer the run from the block to the drum, the greater the ease in tracking the cable. On the prototype, the

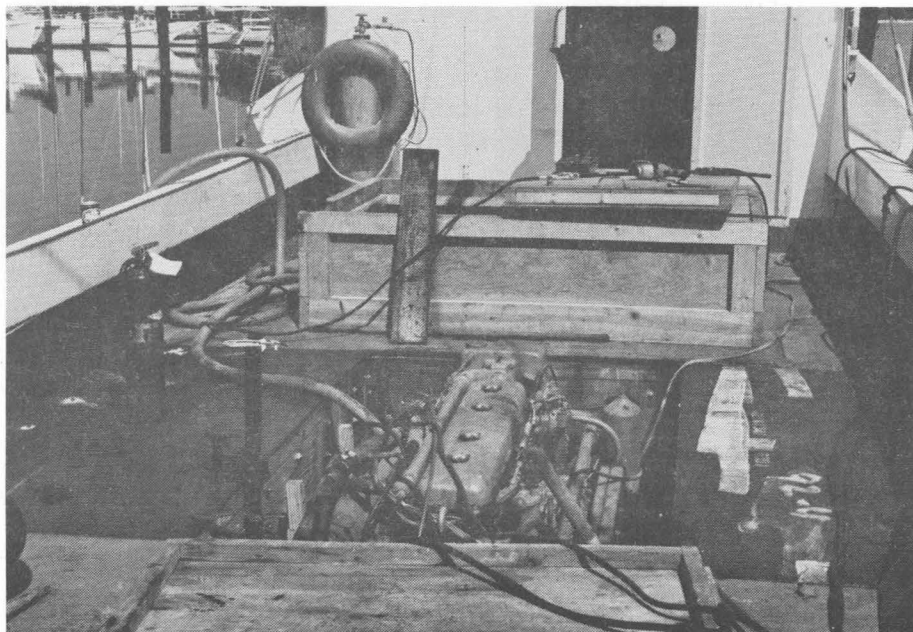
distance from the fairlead block to the drum was approximately 20'.

After the wire has been installed on the outer drums, the center drum is ready to accommodate the net. The procedure for attaching the net to the center drum is essentially the same when using a stern mounted net reel. The only difference is that the combination winch drum is split and controlled by two hydraulic valves, while the conventional net reel has a solid drum and is controlled by one valve.

The procedure is as follows: 1) Two 3/8" wire cables with hooks on either end are attached to the rings on the center drum. 2) These cables are hooked into rings that are spliced into the bridles on the wings. 3) The operator depresses both control valves equally and simultaneously, engaging all three drums. 4) The cables pull the bridles over the stern roller assembly and onto the center drum. 5) The net is fairled over the roller frame and is stored on the center and outside drums. The net is now ready to be set.

SHOOTING THE NET

- 1) Engage the hydraulic system.
- 2) Engage all three drums with simultaneous



The addition of a fish hold forward of the engine and steel deck plating allows the frame to be mounted on either side of the engine.

and equal pressure on each control valve. 3) Cast the cod end over the stern roller assembly and power the net out. 4) Attach the ground wire to the bridles. 5) Haul the ground wire back on the drums and remove slackened hooked cables. 6) Run ground wires out and attach G-hook to backstraps. 7) Hookup trawl wire to doors. 8) Take up trawl wire slack and disconnect hookup chains. 9) Set back doors in the water observing that they are spread open and even. 10) Power out the appropriate amounts of cable, paying close attention to the beckets in the wire. 11) Stop the winch and hook the safety chains to the outer periphery of the outside flanges, preventing the possibility of freewheeling. 12) Disengage hydraulics and commence with tow.

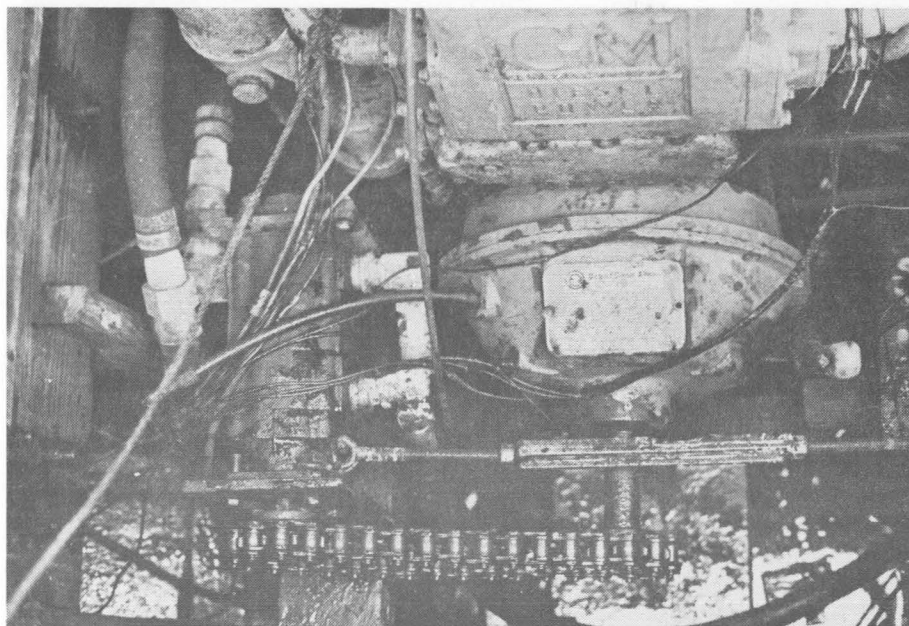
The hookup of the doors, ground wires, bridles and towing warp should be familiar to most experienced draggers. The only difficulty the operator on the prototype encountered was attempting to keep the doors even and synchronized when setting. Because the wire is powered out, as opposed to being set out under brake tension (conventional winch), some familiarity with the "touch" of the control valves was necessary. The operator must pay constant attention to

the beckets in the towing warp to assure an even set.

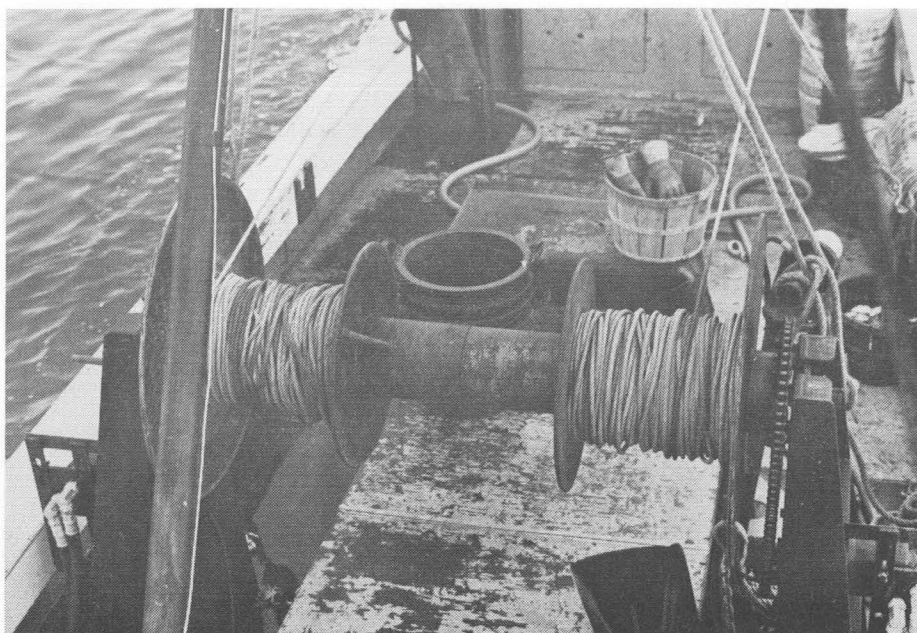
HAULING BACK

1) Engage the hydraulics and disconnect the safety chains from the outer flanges. 2) Engage all three drums, by synchronizing both control valves. 3) Haul back the towing warp until the doors reach the hanging block. 4) Connect the hookup chains and slacken off the warp until the doors hang tight. 5) Disconnect the towing warp and the slackened backstraps from the ground wires. 6) Haul back the ground wires until the bridles reach the roller assembly. 7) Attach the hooked wire cables to the center drum and bridles. 8) Slack off cables. 9) Disconnect ground wires from bridles and synchronize the drums, hauling the ground wire on the outer drums and the bridles and net on the center drum. 10) Allow any excess mesh to spill over onto the outer drums after all the ground wire is retrieved. 11) Attach gilson to cod end and hoist it aboard.

The same skills that are necessary for the operator to set the gear will be



The power takeoff hookup to the hydraulic two-stage pump has a 100-gauge chain and sprocket arrangement.



The winch is mounted over the engine box on the deck of the boat.

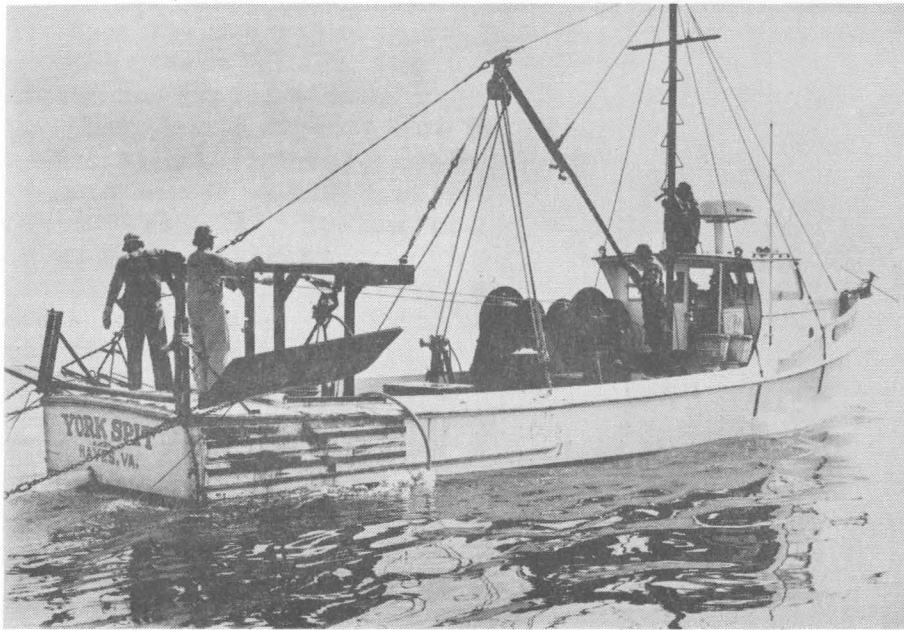
used in hauling back. Since there is no radical difference in the hookup of the doors, bridles, net, etc., most draggersmen will be completely familiar with all of the components and procedures. Fishermen must, however, learn the "touch" of the control valves to synchronize the speed and direction of rotation of the drums. Learning to operate the Split Winch - Combination Net Reel will demand about as much time and expertise as it would take to become proficient with conventional winches. Anyone that has spent time operating winch systems, whether on fishing vessels, cargo ships or logging operations, is aware that every winch responds and handles differently even if it's the same make or type. Hydraulically powered winch systems are more susceptible to this phenomenon than mechanical systems. Uneven flows from single stage pumps, mismatched components and poor or clogged filtration systems are common sources of erratic winch performance.

HANDLING THE COD-END

Whenever large bags of fish are hoisted aboard in poor or marginal weather conditions there exists a potential danger

to crew safety and vessel stability. It is therefore imperative that the proper rigging be provided to handle the bag effortlessly and efficiently, minimizing the chances for any potential accident to gear and crew. The location of the split winch on deck is the primary factor in determining what type of rigging will be necessary to handle the cod end. Essentially there are two methods of bringing the net aboard: over the stern, by means of a roller assembly or stern ramp, or directly over the side.

Because the prototype winch was mounted amidships over the engine box on a Chesapeake Bay deadrise with a raised rear deck, it was decided to handle the bag over the side, necessitating the addition of a mast and boom for the gilson. A single mast and boom constructed out of schedule 80 steel pipe was stepped to the keel against the aftside of the pilot house. The mast was stayed aft to the gallows frame, forward to the stern and side stayed to chain plates on the hull abreast of the pilot house with 5/8" galvanized wire and turnbuckles. The rigging for the gilson was composed of two double sheaved wooden blocks with 1" braided nylon line shackled to the end of the boom. A 5" bronze winch head powered



The doors are disconnected from the towing warp and then attached to the hookup chains as the crew hauls back the gear.

directly by a Charlin "E" type motor controlled from a valve in the pilot house was mounted to a swiveling tripod on the port side just aft of the winch.

The procedure for hoisting the bag aboard the "York Spit" was simple, efficient and fast. When the wings reached the stern roller assembly, the bull line was detached and brought around the outside of the starboard gallows frame, where it was then fairled through a bronze open-faced single block attached to the starboard wash rail. The winch head operator then hand-over-hands the bull line, removing all of the slack until the bag comes along the starboard side. The gilson is attached to the net with a splitting or heaving strap, while the winch head operator releases the bull line, secures the gilson to the winch head and hand-over-hands the gilson line. The operator hoists the bag clear of the wash rail, swings it over the deck and releases the tripper, spilling the catch into the fish checker. Next, the operator releases the strain on the gilson while the crew disconnects the splitting or heaving strap and casts the bag back over the side. The bull line is brought back around the outside of the starboard gallows frame and reconnected to the net. The gear is now ready to set.

HYDRAULICS

The decision to use hydraulic components instead of mechanically powered components was based primarily on the versatility of hydraulics in transmitting power.

In a mechanical system the winch must be located directly over the power source which transmits the power through a series of stationary sprockets and chains. Since hydraulics operate under the principle of pumping fluid under pressure, hydraulic motors can be located anywhere on the vessel, which enables the winch to be mounted in more than one location. The components used in the prototype system were: 1) two Charlin #10,000 motors to drive the winch, 2) a Greensen two-stage pump (50 gpm), 3) two Greensen open spool valves to control the winch motors, 4) and a Charlin E motor for the winch head and a Greensen closed spool value to control it.

Hydraulic components, if installed with a proper filtration system that efficiently eliminates all contaminants, will operate trouble-free for years and will only need preventive maintenance. On the prototype two filters were installed,

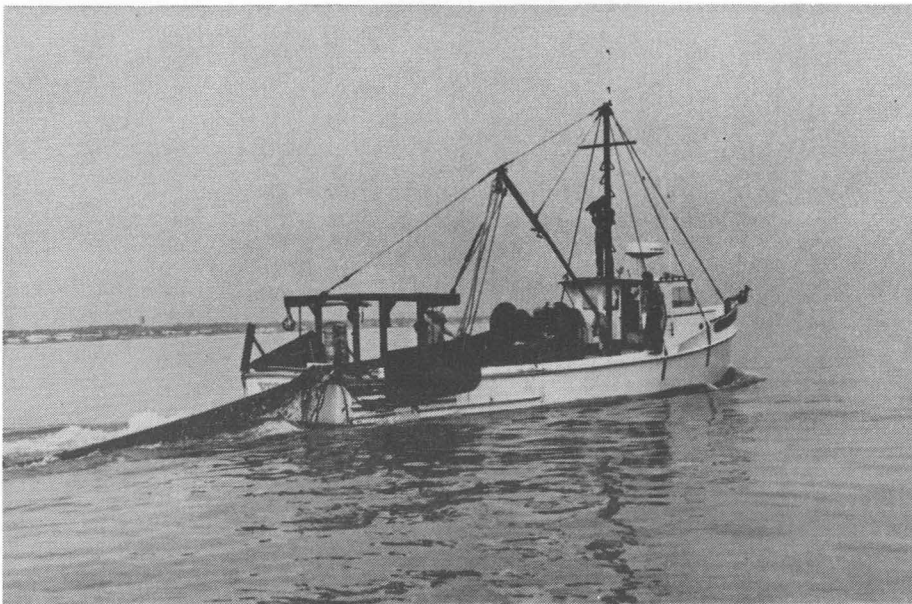
one on the pressure side of the system and one on the return.

AUTHOR'S NOTE

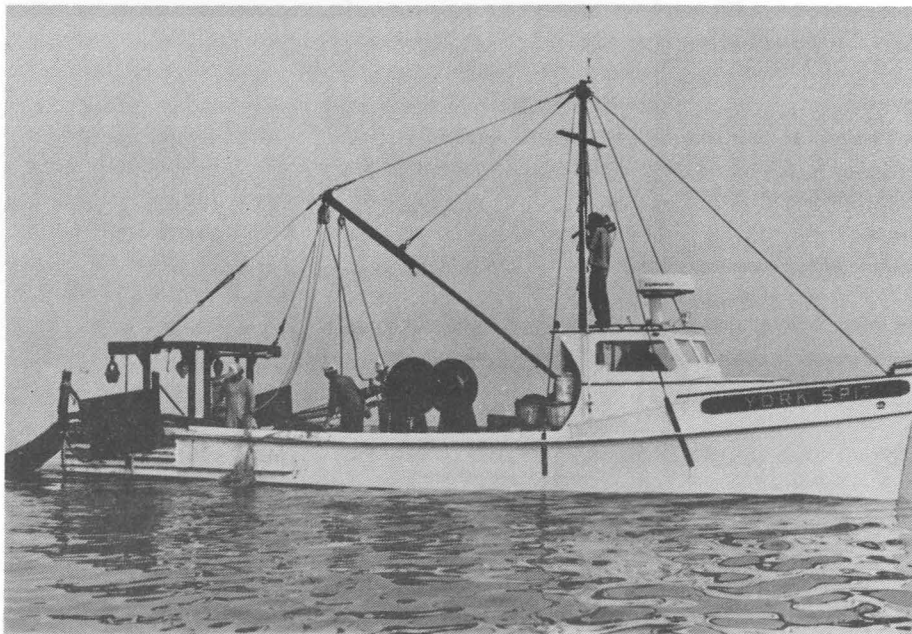
The author would like to extend his appreciation to James E. Brewitt, owner and Richard "Dickie" Kellum, captain, of the F/V "York Spit." Special thanks are due to Calvin Hudgins and crew of Calvin Hudgins Welding in Seaford, Virginia.

For further information about the Split Winch-Combination Net Reel, please contact:

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The doors are suspended from the gallows frame and the ground cable bridles and net are wound on the split winch. The crew member on the starboard side pulls the bull line to bring the cod end alongside to be hoisted aboard.



The crew prepares the gilson to bring the bag over the side. The double-faced block is at the end of the mast. A hydraulically powered capstan head on the port side hoists the gilson and bull line aboard.



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Kym Young Editor

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